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S. D.—87. [This leaflet is distributed only with the seeds to which it relates.]

United States Department of Agriculture,

BUREAU OF PLANT INDUSTRY,

New and Rare Seed Distribution.

WASHINGTON, D. C.

ALFALFA.

Instructions adapted to Ohio, Indiana, Illinois, Iowa, Missouri, and Kentucky.

OBJECT OF THE DISTRIBUTION.—The distribution of new and rare seeds has for its object the dissemination of new and rare crops, improved strains of staple crops, and high-grade seed of crops new to sections where the data of the department indicate such crops to be of considerable promise. Each package contains a sufficient quantity for a preliminary trial, and where it is at all practicable the recipient is urged to use the seed for the production of stocks for future plantings. It is believed that if this practice is followed consistently it will result in a material improvement in the crops of the country.

Please make a full report on the inclosed blank regarding the results you obtain with the seed.

DESCRIPTION.

Alfalfa (*Medicago sativa*) is a deep-rooted, hardy, perennial forage plant, belonging to the family which includes peas, beans, and clover. It occupies the same place in western agriculture that clover fills in the east. As a hay crop alfalfa is to be preferred to red clover in the eastern portion of the country wherever it can be successfully grown. It is slightly superior to red clover in feeding value, and the number of crops that alfalfa produces in a season makes the total yield per acre much greater. Since it is perennial, it will last a number of years unless crowded out by weeds or otherwise destroyed.

SOIL REQUIREMENTS.

Deep loam soils with open subsoils are undoubtedly best for alfalfa, but there is an abundance of evidence to show that it may be successfully grown on soils of almost any texture from sandy or gravelly loams to heavy clays if they are sweet, well drained, and properly supplied with organic matter and plant food. It is, however, practically useless to sow alfalfa on thin soils where the bedrock is near the surface or on land which is underlain at comparatively shallow depths by hardpan or a subsoil that is so compact that the roots can not penetrate it. It is also equally useless to attempt to grow alfalfa where the slope is not sufficient to carry off the surplus water or where the water table occurs near the surface. The rich, well-drained river or creek bottom lands are generally admirably suited to the crop. Overflows may do no serious damage provided they are not of long duration and come during the winter or early spring months, when growth is practically dormant. As a general rule, soils of limestone origin have proved well suited to alfalfa. In some cases, however, the calcium carbonate has been leached from the surface soils to such an extent that liming is essential before alfalfa will succeed.

In examining a tract of land for alfalfa, frequent borings should be made with a soil auger to determine the character of the soil and subsoil, as well as the drainage conditions. This auger will be of greater value in determining the adaptability of a particular tract of land to alfalfa than a chemical analysis of the soil.

PRECEDING CROP.

Alfalfa may be successfully grown after almost any crop when the land is given the proper treatment. It is generally recommended, however, that it be put on land that has previously been in a cultivated crop for one or two years, thus giving an opportunity for destroying the weeds, which are a most dangerous enemy to the success of alfalfa. Canning peas, early potatoes, and sweet corn furnish this opportunity and may generally be removed in time

to successfully sow to alfalfa the same season. Winter wheat and clover also mature sufficiently early to allow ample time for late summer sowing. The common objection to the practice of sowing after any of these crops is the possible lack of moisture due to the demands of the preceding crop. Sowing on sod land is not generally recommended, chiefly because it does not offer sufficient opportunity for destroying the weeds.

PREPARATION OF LAND.

The tender nature of the alfalfa plants requires that the soil be in excellent tilth at the time of planting. Many of the failures to secure a good stand may be traced directly to the improper condition of the seed bed. The soil should be fine and loose for the upper 2 or 3 inches and below that it should be sufficiently firm to favor capillary action, yet porous enough to insure good drainage and aeration. Where practicable, the land should be plowed in the fall. The following spring it should be disked thoroughly and then harrowed until a firm, fine seed bed is obtained. Where fall plowing is not practicable, the land should be broken the following spring, as soon as the weeds start growth. At least 4 to 6 weeks should intervene between the time of plowing and sowing. During this time the land should be harrowed every 10 or 12 days to keep down the weeds and conserve the moisture. When clover precedes alfalfa, the land should be broken as soon as this crop is removed and then harrowed at frequent intervals until the seed is sown early in August. If it follows winter wheat or other small-grain crops, a thorough disking, followed by frequent harrowings, is all that will be required, provided the land is fairly mellow and free from weeds. On land that has been in early-maturing crops, such as potatoes, peas, and sweet corn, no preparation other than two or three thorough harrowings may be needed. If the alfalfa is to be sown after grass, the land should be manured and cut up thoroughly with a disk harrow before plowing.

LIMING.

Probably no other field crop requires lime to such an extent as does alfalfa, and with the possible exception of limestone regions all soils in the region specified may be safely considered to require liming for this crop. Even in regions underlain by limestone, applications of lime may be beneficial, as the soils in such locations may not have been derived from the underlying formations, or, if they have been, a large amount of the calcium carbonate originally present may have been lost through leaching. The lime may be applied with a manure spreader, a fertilizer distributor, a lime distributor, or by hand. Any method that spreads it uniformly and at low cost is satisfactory. It should be spread on the land at least two or three weeks before sowing, in order that it may become thoroughly incorporated with the soil. Where ground limestone is used, at least half of it should be applied in the fall or to the preceding crop, since the calcium carbonate in this form is not as readily available as in the burned lime. The amount that should be applied will depend upon the needs of the soil, but should generally be not less than one ton of burned lime to the acre. If ground limestone is to be used, the quantity should be doubled. Experiments have shown little difference in the final results obtained from the use of the different forms of lime, provided equal amounts of calcium oxid, which is the essential element, are applied. Burned lime will give quicker results, but the ground limestone will finally give the same benefit. It is therefore recommended that the farmer use whichever form is cheapest, based upon the percentage of calcium oxid present. Where the consumer pays the freight, it should be remembered that he will not only have to pay such charges on practically twice as much of the ground limestone as of the burned lime, but will also be to the additional expense of hauling and spreading two tons of the former to one of the latter in order to obtain the same results.

FERTILIZING.

Well-rotted stable manure which is comparatively free from weeds aids greatly in getting a stand of alfalfa. If the manure is not available and the soil is badly in need of humus, some green-manure crop may be used to good advantage. When well established, alfalfa is able to get most of its nitrogen from the air, but it requires large amounts of phosphoric acid and potash. Many of the soils produce good crops of alfalfa without mineral plant food, but most of them produce better crops after phosphorus has been applied. On many of the soils potash also proves beneficial. A mixture containing a

little nitrogen, 300 to 500 pounds of acid phosphate per acre, and a small quantity of potash will usually be sufficient, although in some cases heavier applications may be profitable.

INOCULATION.

Alfalfa requires certain bacteria for its successful development. In most cases, where the crop is grown for the first time these bacteria will need to be supplied by some artificial means. This may be best accomplished by broadcasting or drilling 300 to 500 pounds of alfalfa or sweet-clover soil to the acre and harrowing the land as soon as practicable. Inoculation may also be accomplished by the use of artificial cultures, a limited supply of which may be procured from the United States Department of Agriculture free of charge. Full instructions for use accompany each bottle of culture. The combined use of soil and a culture is recommended where both are readily obtainable.

SOWING.

The quantity of seed that is required varies with the perfection of the seed bed, the character of the soil, and the condition of the weather at the time of sowing. Under average conditions about 20 pounds per acre has proved very satisfactory. The seed may be drilled or else sown with some kind of broadcast seeder and then covered with a smoothing harrow or weeder, care being taken to avoid covering deeper than one inch on soils having a heavy texture and $1\frac{1}{2}$ inches on the sandy soils. A much more even stand may be secured by sowing one-half the amount one way and the other half at right angles to the first sowing. As a rule, a higher percentage of germination is secured when the seed is put in with a drill, and the rate of sowing may therefore safely be somewhat less than where broadcasting is practiced.

If the weather conditions are favorable and the soil is in good condition and free from weeds, it does not seem to make much difference when the seed is sown, so long as there is sufficient time for the plants to become thoroughly established before winter sets in. During midsummer, however, the weather is apt to be too hot and dry to insure successful germination. Better results are generally secured when the seed is sown either about corn-planting time or else delayed until the middle of August, thus avoiding this period of uncertainty. If the moisture conditions are favorable and the land free from weeds, the earlier sowing is to be preferred, but where there is any danger of injury from weeds the later date is preferable. To insure success, sowing should not be delayed beyond the first to the middle of August for the northern and the middle of August to the first of September for the southern portion of these States.

NURSE CROP.

Whether or not alfalfa should be sown with a nurse crop is a much-discussed question. Wherever such a method of sowing can be made successfully it is highly desirable because of the fact that the alfalfa may be put in with little additional expense other than the cost of seed. Moreover, it is not necessary to give up the use of the land for a whole year to get alfalfa established. In early spring sowings such a method is not only desirable but frequently advisable, as the nurse crop tends to keep down the weeds, in addition to furnishing some grain or hay. The evidence at present available indicates that this practice gives satisfactory stands of alfalfa when the soil and moisture conditions are favorable and the seed bed properly prepared. Wheat, barley, rye, and oats may be used for this purpose. Oats, however, are not as satisfactory as the other crops mentioned, since they shade the ground more, require more water, and come off later. Early canning peas have also been successfully used as a nurse crop. If a small grain is used, its rate of sowing should be reduced a third to a half. While this will result in a somewhat lower grain yield, it gives the alfalfa a much better chance. In cases where the nurse crops are so late in maturing that the alfalfa is liable to be injured, they should be cut for hay.

TREATMENT OF STAND.

In spring sowings, unless the weeds threaten to choke out the young plants, the crop should not be cut until it is from 12 to 15 inches high and well in bloom. The sickle bar should be set high, as close cutting at this time often kills the crop. No hay crop should be removed the first year unless the growth is heavy enough to smother the alfalfa plants. It is generally safest to leave a growth of 6 to 8 inches for protection during the winter months. Late sum-

mer sowings need no attention the first fall. The following year the crop should yield three or four good cuttings. If the plants become yellow, the crop should be cut and removed from the field, no matter what the stage of development.

The cultivation of alfalfa to eradicate grass and weeds may sometimes be advisable. Many styles of cultivators are being used, but the one that has generally proved most satisfactory is the "alfalfa harrow," which is a modified form of the ordinary spring-tooth harrow. The use of a disk harrow has in some cases apparently improved the stand, but in many other cases the plants have been seriously injured by its use. It is quite well established that no implement which will seriously bruise the crown of the plants, thus giving an opportunity for the entrance of disease, should be used. Cultivation may take place early in the spring or immediately after cutting the crop.

When a stand of alfalfa becomes thin or patchy, it should be plowed up and reseeded. Attempts at patching up poor stands have generally proved futile. If the plants become weak or spindly, a top-dressing of well-rotted stable manure sometimes improves the growth. In the absence of the manure an application of 300 to 500 pounds to the acre of acid phosphate, with a small amount of potash distributed in the early spring or immediately after any cutting except the last, has been found beneficial. Notwithstanding the fact that most growers do not consider it advisable to pasture alfalfa, it is not uncommon to find fields that have been successfully pastured with the various farm animals. Under no circumstances, however, should it be pastured until it has become thoroughly established or when the ground is wet or frozen. It should not be pastured closely at any time, for the grazing down of the crowns will often result in destruction.

SOME COMMERCIAL VARIETIES OF ALFALFA.

Common alfalfa.—Under this designation is included the greater part of the alfalfa grown in the United States, the seed from the various sources frequently being named after the State in which it was produced. Where alfalfa has been grown under certain conditions for a considerable time there is a tendency through elimination to produce a more or less distinct strain, presumably best adapted to the conditions under which it was developed. Thus, for instance, seeds from fields that have resulted from several seed generations in Montana and the Dakotas may produce plants that will prove to be somewhat more hardy than those from seed grown farther south. Such northern-grown seed is preferred to the southern-grown seed for the northern part of the United States. In purchasing seed an effort should be made to obtain it from approximately the same latitude as that in which it is to be sown.

Grimm alfalfa.—Grimm alfalfa was introduced into this country in 1857 from Baden, Germany, by Wendelin Grimm, of Carver County, Minn. Careful investigations indicate that it owes its superior hardiness to the fact that it is the result of a natural cross between the common variety and the yellow-flowered alfalfa (*Medicago falcata*) and that by virtue of its being exposed to numerous severe winters the weaker plants were eliminated, leaving only the more hardy ones to perpetuate the strain. Grimm alfalfa does not differ materially in appearance from the ordinary strain, so that the casual observer has difficulty in distinguishing one from the other. While a large percentage of its flowers are of the same color as those of common alfalfa, there are some that represent many shades of violet, yellow, and other hues. The taproots show a tendency to branch, and the crowns are inclined to be low set and spreading, characteristics which undoubtedly are of great importance in rendering the variety resistant to drought. Grimm alfalfa is one of the hardest, if not the most hardy, of our commercial strains. It is recommended for sections where the winters are especially severe and where little protection is given by snow. In sections where winterkilling is not an important consideration it is not thought to be materially superior to common alfalfa.

PUBLICATIONS AVAILABLE.

For further details regarding alfalfa, see Farmers' Bulletins 757, Commercial Varieties of Alfalfa, 1229, Utilization of Alfalfa, and 1283, How to Grow Alfalfa, which will be sent free of charge upon application to the Secretary of Agriculture, Washington, D. C.

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